

book entitled "Particle size Measurement", Second Edition, published by Chapman and Hall Ltd.(1975)[Enclosure 1] and a copy of a page from Ullmann's, Encyclopedia of Industrial Chemistry, Fifth Edition, Vol. A7, p. 160-161, 1986, editor Wolfgang GERHARTZ, publisher:VCH. The Examiner's attention is also directed to U.S. 6171567.

Applicants, by the undersigned, thanks the Examiner for the telephone conference on Friday August 30. The Examiner was of the view that Claim 13 referred to D₉₀ in a way that was unclear. In applicants' version of Claim 13, the algebraic equation defining sigma, σ , is complete in terms of D₁₀, D₅₀ and D₉₀ and each of D₁₀, D₅₀ and D₉₀ are in fact defined in terms of a specific diameter.

These references tend to support the proposition that the given definition of D₉₀ (D₅₀) is a classical implicit definition. The numerical value therefor can be directly read on standard cumulative particle size distribution graph(s). Those graphs give, as a function of the diameter "d", the total percentage of particles whose diameter is less than "d" (see as an example in annex, fig. 4.3 from Terence ALLEN's book "Particle size Measurement"). To find the value of f.i. D₅₀, select the value 50 on the "Y" axis and read the corresponding value of D₅₀ on the "X" axis.

Moreover, the reference, U.S. Patent No. 6,171,567B1, newly cited by the Examiner shows that very same proposition in the paragraph bridging columns 1 and 2. This patent recites a PCT publication date of 1995.

CLAIM REJECTIONS - 35 USC §103 and DOUBLE PATENTING

Because the content German Patent Doc DE 4100645A1 to Regler [hereinafter 'Regler'] is a basis for each of the two referenced-based rejections it will be discussed first. Applicants respectfully traverse the rejection of Claims 1-10 and 12 under 35 U.S.C. 103(a) as

unpatentable over German Patent Doc DE 4100645A1 to Regler [hereinafter 'Regler'] in view of WO 95/19835.

Applicants wish to stress the following points, relating to Regler:

- Regler's invention lies in the addition of ***nitrogen containing compounds, in order to reduce the emission of nitrogen oxides***. This is not at all the subject of applicants' invention to basic alkali and/or alkaline earth compounds; and it is not particularly relevant to the object of the invention, which includes solving an agglutination problem, of sodium bicarbonate. Thus, a man skilled in the art who wants to solve an agglutination problem ***would not look at the Regler's paper at all!***
- In applicants' invention the bicarbonate is the main active constituent whereas the magnesium compound is a caking inhibitor ***additive***. This is emphasized in originally filed claim 3. To the contrary, in Regler, the alkaline earth compound can be the main or only (and even ***preferred***, see best mode in the example) active basic constituent for the gas purification.
- Concerning the embodiment where the caking inhibitor is lignite coke, one has to realize that lignite is a very particular coal, with the lowest calorific value (see Ullman's reference, in annex) which is different from ***active*** coal (see specification p.2, 1.30-33, which states that active charcoal is a ***different*** constituent).
- Regler's compositions comprise alkali and/or alkaline earth. The selection of sodium bicarbonate ***and*** a magnesium compound among 6 alkali and 4 alkaline earth (burned lime, calcium hydroxide, calcium carbonate and magnesium compound) amounts to the selection of two elements among a list of 10 elements, that is one among 90 (10 times 9). Moreover, Regler recommends adding a surface active substance, including one which is

silica. The probability to **avoid** silica is 4/5, since silica is in a list of 5 elements. In summary, the reconstitution of the constituents of the invention through multiple selections in the 3 Regler's lists, amounts to a selection of one element in a hundred!

- In order to reconstitute the invention, starting from Regler, the skilled man would have had, after the selection of one-among a hundred of possibilities, to **modify the proportions** of the selected constituents of the composition. Indeed, in Regler, the magnesium compound is a (or even the) basic active substance for gas purification. In his only example, Regler discloses a composition consisting of calcium hydroxide only (which is in the same list as the magnesium compounds). To the contrary, according to the invention, the magnesium compound is an additive, in proportions of at most 10% in weight!
- The comparison of the applicants' specification examples 7 (in accordance with the invention) and 8 (not in accordance with the invention reveals the particularly interesting advantage of avoiding, according to the invention, the presence of silica. in the reactive composition.
- In conclusion, the Examiner's reasoning is a real *a posteriori* reconstruction of the invention. To the contrary, the complexity of the selections and modifications needed to reconstitute the claimed subject mater proves that the invention is *nonobvious* over Regler.

With respect to the PTO reliance on the Graham determinations, it is applicants' view, that the differences between the applied references are such that a person of ordinary skill would not look to the actual descriptions of the references and find the language of the rejected claims or the discovery of the problem recognized by applicants. Particularly, the

applied references provide no motivation or expectation of success, with respect to the language of the rejected claims.

DOUBLE PATENTING

Applicants' respectfully traverse the obviousness-type double patenting rejection.

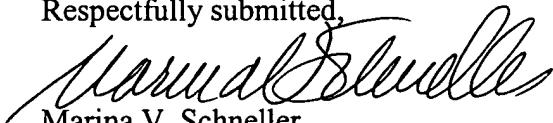
Substantively, applicants note that the discussion above with respect to the non-obviousness of the invention over Regler, also moots the double patenting rejection.

Legally, applicants' note the Studiengessellschaft Kohle mbH v. Northern Petrochemical Co. [228 USPQ 837 Fed.Cir. 1986] case precedent. In this case, the court held that claims to a product are not directed to the same invention as claims directed to a process of use, viz., "[B]ecause the two patents claim different statutory classes of subject matter, composition and process, they are not the same invention. Studiengessellschaft Kohle mbH v. Northern Petrochemical Co. [228 USPQ 837, at 840]"

In applicants' view combining two references which relate to inventions different from each other and different from the claims at issue does not provide a prima facie grounds for double patenting. Evidence of this is that the very composition which applicants' expressly seek to exclude from the claims at issue could be used in a way to infringe the claims of the cited patent [6171567B1].

Reconsideration and an early allowance are respectfully solicited..

Respectfully submitted,



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Tues. Sept 3 2002
Date

In re Patent Application of:

Applicants : Nilo FAGIOLINI et al.

Appln. No. : 09/423,746

Filed : November 15, 1999

For : REACTIVE POWDER COMPOSITION
AND METHOD FOR PURIFYING GAS

Atty. Dkt. : 32232-152197

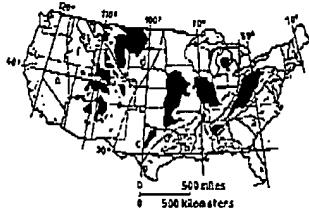
MARKED UP VERSION OF CLAIM AMENDMENT

1. (FIVE times Amended) Solid pulverulent reactive composition for the purification of a gas, comprising at least 90% by weight of sodium bicarbonate and a caking inhibitor for sodium bicarbonate and being devoid of silica, said inhibitor comprising lignite coke and/or a magnesium compound selected from the group consisting of magnesium oxide, magnesium hydroxide, mixtures of magnesium oxide and magnesium hydroxide and magnesium hydroxycarbonate, wherein said composition exhibiting a mean particle size of less than 50[μ] um and a particle size slope of less than 5 and wherein said inhibitor present in an amount by weight of greater than 0.5% of the weight of sodium bicarbonate.

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Figure 1. Geographic location of the world's coal

Figure 2. Coal provinces of the continental United States
a) Eastern; b) Gulf; c) Interior; d) Northern Great Plains; e) Pacific Coast; f) Rocky Mountains

younger, these coals tend to be of lower rank, usually subbituminous, than the Carboniferous coals. Since the Cretaceous some coal has been deposited in scattered locations more or less continuously and tends to be lignite or brown coal.

The distribution of coal seams throughout the world is also not uniform. As shown in Figure 1, most of the world's coal is located in only three countries, the United States, the Soviet Union, and China. Although the figures vary from source to source, each of these countries has about 23% of the total coal resources, while the rest of the world shares the remaining 25%.

In the United States, bituminous coal seams are concentrated in the Appalachian and Illinois Basins. Most of the subbituminous coal occurs in the various smaller basins in the Rocky Mountain region, and the lignite seams are concentrated in the northern Great Plains and the Gulf Coast area.

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4. Classification

Coal is combustible and should be composed of more than 50 wt% carbonaceous material [11]. Commercially, coal is classified in a number of ways on the basis of (1) the original plant or material composition, sometimes called coal type, (2) the degree of maturity or metamorphism, called coal rank, (3) the amount of impurities such as ash or sulfur, called coal grade, and (4) the industrial properties such as coking or agglomeration.

One of the main classifications by composition used by the United States Bureau of Mines is based on the relative amounts of petrographic entities depicted in thin-section analysis, including anthracite (translucent), material roughly equivalent to vitrinite, translucent carbon (roughly equivalent to lithinite), and opaque asphaltenes and fusin (roughly equivalent to inertinite) [12], [13]. Under this system, coals are divided into two groups: banded coals, with > 5% anthracite, and nonbanded coals, with < 5% anthracite. The banded coals are subdivided into three types: *bright coal*, consisting mainly of anthracite and translucent carbon with < 20% opaque matter; *semiplaint coal*, consisting mainly of translucent and opaque carbon with 20–30% opaque matter; and *plastic coal*, consisting mainly of opaque carbon with > 30% opaque matter. The nonbanded coals are divided into *asphalt coal*, consisting of asphaltenes with spars, and *bituminous coal*, consisting of asphaltenes with algin.

The various bands or layers in coal evidence to the unaided eye have also been classified into four types [14]. *Vitrin* layers appear bright and vitreous, *char* appears as relatively less bright, *striated* layers, *char* is dull and featureless, *tar* layers are dull gray and like charcoal. Although these terms (all ending in *in*) are not scientific terms meant to be applied to human specimen samples, they do have some compositional implications at the microscopic level. For example, vitrin layers contain mainly vitrinite minerals, fusin layers contain mainly inertinite minerals, and char and striated are mixtures of all three mineral types.

The most important classification for commercial purposes in the United States is the ASTM classification by rank. It is the basis on which most of the coal in the United States is bought and sold. This classification, ASTM Standard D 388 shown in Table 3, divides coal

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Table 3. Classification of coal by rank*

Class	Group	Fixed carbon limits, %	Volatile matter limits, % (dry, mineral- matter-free basis)	Calorific value limits, Btu/lb (moist, mineral-matter-free basis)*	Agglomerating character
Anthracite	maceralytic	≥ 93	—	≥ 12	non- agglomerating
	anthracite	≥ 93	< 9%	≥ 12	
	subanthracite	≥ 93	< 9%	≥ 14	
Bituminous	low-volatile bituminous coal	≥ 73	< 5%	≥ 14	commercially agglomerating*
	medium-volatile bituminous coal	≥ 69	< 12	≥ 11	
	high-volatile A bituminous coal	—	< 6%	≥ 11	
	high-volatile B bituminous coal	—	< 6%	≥ 11	
Subbituminous	high-volatile C bituminous coal	—	—	≥ 14 000*	commercially agglomerating*
	subbituminous A coal	—	—	≥ 13 000*	
	subbituminous B coal	—	—	≥ 11 500	
Lignite	subbituminous C coal	—	—	≥ 10 500	nonagglomerating
	Epith A	—	—	≥ 6 500	
	Epith B	—	—	≥ 6 300	

This classification does not include a *low* coal, principally noncaking varieties, which have unusual physical and chemical properties and which come within the limits of fixed carbon or calorific value of the high-volatile bituminous and subbituminous ranks. All of these coals either contain < 4% dry, mineral-matter-free fixed carbon or have > 15 500 Btu/lb moist, mineral-matter-free.

Moist refers to coal containing its natural inherent moisture but not including visible water on the surface of the coal.

Calorific value is calculated on a dry, mineral-matter-free basis. In this classification, coals containing 63% or more fixed carbon on the dry, mineral-matter-free basis shall be classified according to fixed carbon, regardless of calorific value.

It is recognized that there may be nonglomerating varieties in these groups of the bituminous class, and there are notable exceptions in high-volatile C bituminous group.

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into classes, groups, and subgroups. The classes are similar to ASTM groups and based on dry, ash-free volatile matter (p. 260) and moist, ash-free calorific value. The classes are numbered 0 to 9. The classes are divided into four groups, numbered 0 to 3 on the basis of the swelling properties (free-swelling index (p. 245), also called crucible swelling number, and Roget index). These groups are further broken down into six subgroups numbered 0–5 on the basis of their Audibert–Ann dilatation number and Gray–King coke type. The system is set up in such a way that all coals are classified with a three-digit number, in which the first digit is the class, the second is the group, and the third is the subgroup.

The lignites and brown coals are only divided into classes and groups. The classes, numbered from 1 to 6, are based on ash-free moisture; the groups, based on dry, ash-free moisture, are numbered from 0 to 4. This classification is shown in Table 5 (p. 163).

Although the ASTM and International Systems are different, there is a reasonable corre-

PARTICLE SIZE, SHAPE AND DISTRIBUTION

Table 4.8 (a) Cumulative percentage undersize distribution

Particle size (μm)	Cumulative percentage undersize
5	$\phi = \frac{x}{\phi} \text{d}\phi$
9	1.4
11	9.4
14	18.0
17	32.0
20	49.5
23	64.0
28	76.0
33	88.0
41	94.0
50	98.0
60	99.4
	99.9

ϕ , the frequency function = ΣdN for a number distribution
= $\Sigma x dN$ for a size distribution
= $\Sigma x^2 dN$ for a surface distribution
= $\Sigma x^3 dN$ for a volume or weight distribution where dN is the percentage of the total number of particles lying in the size range x_1 to x_2 .

Table 4.8 (b) Relative percentage frequency distribution: tabular calculation of mean size

Particle size range x_1 to x_2	Interval dx	Average size x	Percentage in range $d\phi/dx$	Percentage per micrometre $d\phi/dx$	$x d\phi$
0 to 5	5	2.5	1.4	0.3	4
5 to 9	4	7.0	8.0	2.0	56
9 to 11	2	10.0	8.6	4.3	86
11 to 14	3	12.5	14.0	4.7	175
14 to 17	3	15.5	17.5	5.8	271
17 to 20	3	18.5	14.5	4.8	268
20 to 23	3	21.5	12.0	4.0	258
23 to 28	5	25.5	12.0	2.4	306
28 to 33	5	30.5	6.0	1.2	183
33 to 41	8	37.0	4.0	0.5	148
41 to 50	9	45.5	1.4	0.2	64
50 to 60	10	55.0	0.5	0.1	28

$$\text{Mean size} = \frac{\Sigma x d\phi}{\Sigma d\phi} = 18.47$$

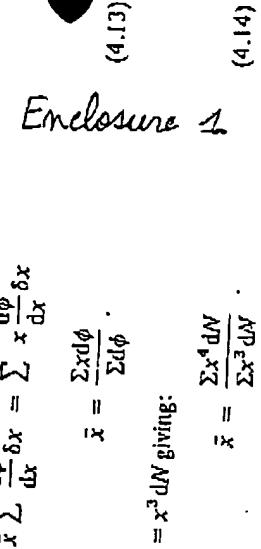


Fig. 4.3. The cumulative percentage frequency curve.

passes through the centre of gravity of a sheet of uniform thickness and density equal to the shape of the distribution. Hence, for the mean, the moment of the sum of all the elementary areas of thickness δx about the ordinate equals the sum of all the moments:

$$\bar{x} \sum \frac{d\phi}{dx} \delta x = \sum x \frac{d\phi}{dx}$$

$$\bar{x} = \frac{\sum x d\phi}{\sum d\phi} \quad (4.13)$$

For a weight distribution $d\phi = x^3 dN$ giving:

$$\bar{x} = \frac{\sum x^4 dN}{\sum x^3 dN} \quad (4.14)$$

The mode and the median may be determined graphically but the above summation has to be carried out for the determination of the mean. However, for slightly skewed distribution, the approximate relationship $\text{mean} - \text{mode} = 3(\text{mean} - \text{median})$ holds. For a symmetrical distribution, they all coincide. In the illustration, the values are: mode = 15.0; median = 17.2; yielding mean = 18.2, as compared with the summated value of 18.47 (table 4.8).